# SOUNDING OUT FOR SMELT

By Jason Lee

Lake Sakakawea is North Dakota's most popular fishery. A 2003 creel survey showed anglers fished about 1.2 million hours and harvested 282,400 walleye, 10,500 sauger, 6,900 chinook salmon, and 6,800 northern pike.

Part of what drives this popular fishery is rainbow smelt, the primary forage for Sakakawea's game fish. Smelt are slender, silvery-colored fish that seldom grow longer than 12 inches. Although small individually, the smelt population as a whole is made up of millions of individual fish.

Since smelt serve such an important role as a food item, knowing their population trends is important in managing the fishery. In 1999, the North Dakota Game and Fish Department initiated an annual hydroacoustic survey on Sakakawea to monitor the rainbow smelt population.

## What is Hydroacoustics?

Hydroacoustics uses sound in water to detect fish, similar to fish locators/finders employed by anglers. The basic hydroacoustic equipment includes an echosounder, transducer, and computer. The echosounder sends and receives the signal through a transducer. The computer stores data and controls setup and operation of the hydroacoustic unit.

The echosounder transmits a pulse of acoustic energy through the water until it encounters an object, like fish, or the lake bottom. The object in the path of the pulse reflects an echo back to the transducer that is then stored in the computer. Smelt, like most fish, have an internal, inflatable sack or air bladder that regulates buoyancy. It's this low density air bladder that reflects the majority of the signal back to the transducer.

The smelt survey is typically conducted in August when there is a distinct division between warm and coldwater habitats in the reservoir. Adult rainbow smelt are coldwater fish and are generally confined to the coldwater habitat in the later days of summer.

Smelt are sensitive to both light and temperature. During the day, smelt distribute near the bottom of the reservoir. At night, they rise off the bottom, relocating near the thermocline, or where warm and cold water meet. Because of this behavior, the survey is conducted at night during the new moon phase, or darkest time of the month, which is the most effective time to sample smelt with sonar.

During the survey, a large transducer mounted on a large fin is towed along side the boat, which follows a series of predetermined zigzagging transects across the lake from shore to shore. The survey typically starts at Garrison Dam and ends at White Earth Bay, taking about 25 hours to complete.

The boat is rigged with radar and global positioning equipment to ensure safe night operation. Surveying is also restricted to periods with little or no wind to keep the transducer properly orientated.

## What's Being Measured?

The annual hydroacoustic smelt survey provides an estimate of the abundance, size, and distribution of rainbow smelt in Lake Sakakawea. An estimate of fish size is determined by the amount of acoustic energy reflected by individual fish to the transducer. However, since smelt are often found in large, dense schools or "clouds" at the time of the survey, not all fish sizes are estimated.

The survey provides an estimate of the total biomass, or total weight of smelt found in the lake's coldwater habitat. The hydroacoustic equipment also records at what depth smelt are found. In most years, younger fish are higher in the water column than larger smelt. Young-of-the-year smelt often form clouds above both the thermocline and larger fish. The reason for the division is that young-of-the-year smelt are able to tolerate warmer temperatures.

## Latest Findings

In the last five years, annual smelt population estimates within coldwater habitat were about 61 million fish in 1999, 60 million in 2000, 79 million in 2001, 30 million in 2002 and 49 million in 2003. The largest fluctuation occurred between 2001 and 2002 when smelt abundance decreased from nearly 79 million fish to 30 million, and the estimated biomass also dropped from 1.8 million pounds to 227,000 pounds. This decrease coincided with about a four-foot drop in Sakakawea's summer water elevation.

A high percentage of the fish tracked in 2002 were small, young-of-the-year fish. These fish had lower average weights than fish tracked in previous years. So, both the smaller weights, coupled with reduced numbers of total fish, resulted in a much lower biomass estimate in 2002. A likely reason for this decline in smelt numbers between these two years is the reduced amount of coldwater habitat. In general, as the lake elevation in Lake Sakakawea drops, so does the amount of coldwater habitat favored by smelt.

The 2003 smelt survey showed an increase in smelt numbers from 30 million to 49 million fish. This increase was largely due to the 2002 year-class. Catch rates of small, young-of-the-year smelt during netting surveys in 2002 were the second highest since smelt reproduction surveys began in 1994.

Relatively stable spring elevations during the smelt spawning and incubation period during 2002 helped produce this strong year-class of forage fish.

## What Does This Mean?

The hydroacoustic smelt survey is valuable for tracking the chief food source for sport fish populations in Sakakawea. Game and Fish officials, based on survey findings, have made water level management recommendations to the U.S. Army Corps of Engineers that would enhance smelt populations. Such as: stable to rising water levels during spring smelt spawning and incubation periods; and adequate water levels to provide necessary coldwater habitat smelt require to survive. Finally, survey findings have led Department fisheries staff to adjust stocking rates of predators – walleye and chinook salmon – in light of reduced smelt populations the past two years.

So, what does this mean for the future of fishing in Lake Sakakawea? Hydroacoustic findings show that many smelt currently inhabiting Sakakawea are small, young fish. If habitat conditions are favorable for these coldwater fish in the future, they will provide forage for sport fish for several years. However, current and projected lake levels could lead to stressful times for coldwater species during summer if conditions do not change.

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